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ABSTRACT

A study examined whether ACT subtest scores can be used to predict reading skills, as measured by the Nelson-Denny Reading Test, with a degree of accuracy that would support their use as a screening device for college placement. ACT test scores of 2,431 students were used to predict Form C Nelson-Denny raw scores. ACT test scores from 3,016 students were used to predict the Form E Nelson-Denny raw scores. To achieve clarity and accuracy of prediction, separate analyses were conducted for each form of the Nelson-Denny Test. The results indicated that reading skill, as measured by the Nelson-Denny Reading Test, can be estimated with a moderate degree of accuracy by using the ACT Social Studies Reading and ACT English Usage subtests. In addition, the established statistical relationship between the Nelson-Denny and ACT tests suggests that if the ACT tests are used initially for college placement or course predictions, it is doubtful that the addition of Nelson-Denny test data would result in substantive improvement in the prediction. (Tables of data are included.) (HOD)

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RESEARCH REPORT No. 88

Estimating Reading Skill From ACT Assessment Scores

Julie Noble

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ABSTRACT

This study was conducted to investigate the possibility of predicting Form C and Form E Nelson-Denny Reading Test scores from ACT subtest scores. ACT scores from 2,431 students were used to predict Form C Nelson-Denny raw scores, and scores from 3,016 students were used to predict Form E raw scores. The results indicated that Nelson-Denny Total scores could be predicted, with a moderate degree of accuracy, from ACT English Usage and ACT Social Studies Reading scores. These results support the use of ACT test scores in screening for reading placement. Such use may preclude the need for administering other tests for the same purpose. This report includes tables to estimate Form C and Form E Nelson-Denny Total raw scores from ACT English Usage and ACT Social Studies Reading scores. Tables for converting predicted scores to percentile ranks and grade equivalents are also provided.

ESTIMATING READING SKILL FROM ACT ASSESSMENT SCORES

Julie Noble

Introduction

Changes in admissions policies and entrance standards over the past 15 years have broadened the ability levels of students entering college. As a result, some students have been admitted to college with minimally developed reading skills. Reading skills are essential if students are to function at a satisfactory level academically. To identify enrolling students in need of remediation in this area, the reading skills of students need to be evaluated. In addition, a reliable and valid measure of reading skills can be used to place students in appropriate classes.

Background

The Nelson-Denny Reading Test (Brown, Nelson, & Denny, 1973; Brown, Bennett, & Hanna, 1981) is a nationally known instrument designed to measure students' skills in vocabulary development and reading comprehension. The test is composed of two subtests: a 100-item vocabulary test, which measures students' knowledge of words and word meanings; and a 36-item comprehension test, which includes questions about eight reading passages. The content of the passages involves English literature, social studies, and natural sciences. Three editions of the test have been published, each of which contains two forms. The forms most frequently used are Forms C-D (1973) and Forms E-F (1981), which do not differ in terms of overall content or scoring. However, the means and standard deviations differ from form to form, as reported in the manuals for both forms. A Total mean raw score of 75.4 (SD = 25.1) was reported for the Form C Nelson-Denny standardization sample for college freshmen, and a Total mean raw score of 96.0 (SD = 29.2) was reported for the Form E college freshman sample.

The Examiner's Manuals for Forms C and E of the Nelson-Denny Test (1973; 1981) also provide reliability and predictive validity data. Alternate form reliabilities are reported, with coefficients of .90 for Form C high school seniors and a median coefficient of .91 for Form E for all grades. The predictive validity information focuses on self-reported high school grade point averages in the core subject areas and on standardized admissions tests. Predictions of self-reported grades in English, mathematics, social studies, and natural sciences, using Nelson-Denny Total scores as predictors, resulted in Rs between .17 and .34 for college freshmen. A conversion table is also supplied for converting Form E Nelson-Denny Total scores to ACT Composite scores so that institutional officials can estimate ACT Composite scores from the Nelson-Denny Test. This table, however, is based on a small sample of 82 students and is pertinent only to college freshmen.

The ACT Assessment (1973) includes four subtests that estimate high school students' general educational development in four areas: English usage, mathematics usage, social studies, and natural sciences. Though the ACT Assessment does not provide a reading skills score, the scope and content of the English Usage, Social Studies Reading, and Natural Sciences Reading subtests are such that students must have adequate reading skills to attain high scores. In addition, these subtests have questions similar in content and item type to the Nelson-Denny test. Thus, some statistical relationship between the ACT subtests and the direct assessment of reading skill via the Nelson-Denny might be anticipated.

Related Research

Although several studies have been conducted to determine the relationship between the Nelson-Denny Reading Test and the ACT Assessment, none of them has analyzed this relationship using the most current form of the Nelson-Denny Test (Form E-F). In addition, these studies vary either in the type of Nelson-Denny scores used as criteria (i.e., grade equivalents, percentile ranks) or in the actual scores used (Vocabulary, Comprehension, or Total scores). Also, most of the studies do not provide a conversion table to estimate Nelson-Denny scores from ACT scores.

Munday (1968) and Mist (1970) relied on simple correlational analyses to determine the relationship

between ACT test scores and Form A Nelson-Denny Reading Test scores (score type unknown). Using data from 1,239 students from four colleges, Munday reported correlations of .63 between ACT English Usage and Nelson-Denny Total scores, .40 between ACT Mathematics Usage and Nelson-Denny Total scores, .70 between ACT Social Studies Reading and Nelson-Denny Total scores, .59 between ACT Natural Sciences Reading and Nelson-Denny Total scores, and .72 between the ACT Composite and Nelson-Denny Total scores. Mist (1970) reported similar results using Nelson-Denny Total raw scores, with correlations of .58 for English Usage, .37 for Mathematics Usage, .66 for a sum of Social Studies and Natural Sciences Reading, and .65 for the Composite.

A study by Schroeder (1975) examined the relationship between ACT scores and Form C Nelson-Denny raw scores using a multiple regression approach. He developed regression equations for the Nelson-Denny Vocabulary, Comprehension, and Total scores using the four ACT subtest scores as predictors. It was determined that the Total score on the Nelson-Denny test was the best indicator of reading skill. A prediction equation was developed using the ACT English Usage and ACT Social Studies Reading subtests as predictors (multiple R = .70, N = 1,839). A conversion table was also provided to convert ACT English Usage and ACT Social Studies Reading scores to estimated Nelson-Denny Total raw scores.

Stiggins (1977) examined the relationship between Form A Nelson-Denny Comprehension grade equivalents and ACT Composite scores. Using cross-tabulations of ACT and Nelson-Denny scores, he derived a rough concordance table to estimate Nelson-Denny Comprehension grade equivalents from ACT Composite scores (N = 1,200). Carney and Geis (1981) also used the ACT Composite to predict Form C Nelson-Denny Total raw scores. Three communication skills measures and the ACT subtest scores were also included in the stepwise regression analysis. The results indicated that the ACT Composite yielded the highest multiple R (R = .72, N = 468) of all of the predictors.

The most comprehensive study thus far, conducted by Stiggins, Schmeiser, and Ferguson (1978), examined the relationship of ACT scores to various measures of reading skill, including the Nelson-Denny Reading Test. The differential validity of this relationship was examined for differing years, institutional types, sexes, races, and GPA ranges. The median multiple correlation across all combinations of predictors and institutions for the Nelson-Denny test was .72. The authors concluded that though various combinations of ACT test scores accurately predicted reading skill, none was appreciably better than the ACT Composite. They also determined that all combinations of predictors were effective in predicting reading skill for various subgroups. Consequently, the authors concluded that ACT scores could be useful in determining the need for reading skill remediation at the postsecondary level.

Purpose of the Study

Many institutions currently require standardized test scores for admission or placement into their academic programs. In addition, some institutions administer reading tests like the Nelson-Denny for the purpose of placing students in classes appropriate to their ability levels. This second test administration may not always be feasible or practical. Test data from the ACT Assessment may be used as a screening device for students with reading difficulties, thus eliminating the necessity of a second test. The purpose of this study was to determine whether ACT subtest scores can be used to predict reading skill, as measured by the Nelson-Denny, with a degree of accuracy that would support their use as a screening device for college placement.

Procedures

To examine the relationship between ACT scores and reading skill, two population subsamples were used. The first subsample consisted of 2,431 students from three midwestern universities, all of whom had Form C Nelson-Denny raw scores and ACT test scores. The second subsample consisted of 3,016 students from one midwestern university, all of whom had Form E Nelson-Denny raw scores and ACT test scores. The test scores for both subsamples were obtained between 1980 and 1984, with varying time intervals between administrations of the ACT Assessment and the Nelson-Denny Test. To achieve clarity and accuracy of prediction, separate analyses were conducted for each form of the Nelson-Denny Test.

Means, standard deviations, and correlation coefficients were first examined for both Forms C and E Nelson-Denny test scores and ACT scores. As shown in Table 1, Forms C and E Vocabulary and Total score means each differed by approximately 20 raw score points. Form E Nelson-Denny scores and the ACT scores were somewhat above average for Grade 13 (four-year college/university). The reported Total mean for the Nelson-Denny Form E standardization sample (1981)

was 96.0, and the ACT subtest means from the three-year Standard Research norms (1984) ranged between 18 and 22. The zero-order correlations among the Nelson-Denny and ACT scores for both Forms C and E are reported in Table 2. The results indicate that Form C scores consistently correlated higher with ACT scores that did Form E scores. This difference may result from differences in the two Nelson-Denny forms, from differences in the samples, or from both.

TABLE 1

Means and Standard Deviations for Nelson-Denny and ACT Scores
Form C (*N* = 2,431) and Form E (*N* = 3,016)

	Mean		Standard Deviation	
Variable	Form C	Form E	Form C	Form E
ND Vocabulary	34.56	54.38	14.53	15.42
ND Comprehension	41.32	48.70	11.20	10.23
ND Total	75.88	103.07	23.37	23.58
ACT English	18.84	19.57	4.80	4.23
ACT Math	18.30	20.07	7.05	6.91
ACT Social Studies	18.15	19.44	6.77	6.21
ACT Natural Sciences	21.69	22.22	5.83	5.23
ACT Composite	19.37	20.45	5.13	4.50

TABLE 2

Correlation Coefficients Among Nelson-Denny and ACT Scores
Form C (*N* = 2,431) and Form E (*N* = 3,016)

	ND Comprehension		ND Total		ACT English		ACT Math		ACT Soc. Std.		ACT Nat. Sci.		ACT Comp.	
Variable	C	E	C	E	C	E	C	E	C	E	C	E	C	E
ND Vocabulary	.64	.68	.93	.95	.64	.57	.39	.35	.65	.63	.60	.54	.67	.65
ND Comprehension			.88	.88	.61	.53	.46	.32	.60	.54	.57	.44	.66	.56
ND Total					.69	.61	.46	.37	.69	.65	.64	.55	.73	.67
ACT English							.57	.46	.64	.55	.62	.45	.82	.73
ACT Math									.52	.44	.60	.53	.82	.80
ACT Social Studies											.69	.60	.85	.82
ACT Natural Sciences													.86	.81

Using the Nelson-Denny Vocabulary, Comprehension, and Total scores as criteria, three prediction equations were developed for each form using the ACT subtest scores as predictors. The results are shown in Table 3.

TABLE 3

Regression Coefficients for Nelson-Denny Reading Scores Using ACT Subtests—Forms C and E

Form C

Parameter	Vocabulary	Comprehension	Total
Intercept	-6.03	11.42	5.39
ACT English	1.07	.70	1.78
ACT Math	- .23	.06	- .17
ACT Social Studies	.71	.44	1.15
ACT Natural Sciences	.54	.35	.89
Multiple R	.72	.68	.77
SE_E	10.02	8.21	14.79

Form E

Parameter	Vocabulary	Comprehension	Total
Intercept	3.52	19.19	22.71
ACT English	1.12	.79	1.90
ACT Math	- .15	- .04	- .18
ACT Social Studies	.87	.49	1.36
ACT Natural Sciences	.67	.25	.92
Multiple R	.71	.62	.73
SE_E	10.93	8.07	16.19

The regression equations yielded moderate multiple correlations for both Forms C and E. As with the zero-order correlation coefficients in Table 2, the multiple correlations were slightly lower for Form E than for Form C. Of the three equations (one for each subscore plus Total) for each form of the Nelson-Denny, the equation for predicting the Total score yielded the highest multiple correlation. As the Total scores probably represent the best estimate of reading skill, additional equations were derived using the Total scores as the only criteria. The ACT Mathematics Usage and ACT Natural Sciences Reading subtests were eliminated from the equation: the Mathematics Usage scores contributed negatively to the equation, and the Natural Sciences Reading scores contributed very little to the regression model, either in statistical or practical terms. This procedure produced equations using ACT English Usage and ACT Social Studies Reading scores as predictors. The results are shown in Table 4.

TABLE 4

Regression Coefficients for Nelson-Denny Total Scores Using ACT Social Studies and ACT English—Forms C and E

	Regression Coefficients				
Form	Intercept	ACT Social Studies	ACT English	Multiple R	SE_E
C	11.40	1.48	1.99	.77	15.2
E	30.81	1.70	2.00	.71	16.6

Finally, regression equations were developed using the ACT Composite as a predictor of Nelson-Denny Total scores. Though somewhat less accurate than the other equations, they can be used in cases where ACT subtest scores are not available. The results are reported in Table 5.

TABLE 5

Regression Coefficients for Nelson-Denny Total Scores Using ACT Composite—Forms C and E

	Regression Coefficients			
Form	Intercept	ACT Composite	Multiple R	SE_E
C	11.45	3.33	.73	15.9
E	31.66	3.49	.66	17.6

Tables 6 and 7 were generated using the regression equations containing only the ACT Social Studies Reading and ACT English Usage scores as predictors. Estimated Form C and Form E Nelson-Denny Total raw scores are reported for combinations of ACT Social Studies Reading and ACT English Usage scores. Tables 8 and 9 report the conversions of estimated Form C and Form E Total raw scores to percentile ranks and to grade equivalents. The tables should be used as follows:

1. Given ACT English Usage and ACT Social Studies Reading scores, the predicted Nelson-Denny Total score can be found in Table 6 (Form C) or Table 7 (Form E).
2. To specify a 68% confidence interval for the predicted raw scores, add and subtract 15 points from the predicted Form C raw score, or add and subtract 17 points for Form E.
3. Convert the endpoints of this band to percentile ranks via Table 8 (Form C) or Table 9 (Form E). This process yields a band of percentile ranks in which the subject's true Nelson-Denny Total score probably lies.
4. If grade equivalents are desired, the endpoints may be converted to grade equivalents by using Table 8 (Form C) or Table 9 (Form E).

Discussion

The results of this study indicate that reading skill, as measured by the Nelson-Denny Reading Test, can be estimated with a moderate degree of accuracy by using the ACT Social Studies Reading and ACT English Usage subtests. In addition, the established statistical relationship between the Nelson-Denny and ACT tests suggests that if the ACT tests are used initially for college placement or course predictions, it is doubtful that the addition of Nelson-Denny test data would result in substantive improvement in the prediction. This hypothesis is supported by the predictive validity information available from the Nelson-Denny Form E manual (1981) and from the ACT Standard Research (1984) three-year norms for 1980-1984. The manual reports a multiple *R* of .34 between Nelson-Denny Total scores and self-reported freshman English grades. The Standard Research norms report a multiple *R* of .44 between ACT subtest scores and freshman English grades.

The results of this research indicate that it is possible to estimate reading skill using the ACT Assessment. To this end, conversion tables (ACT to Nelson-Denny) have been developed and reported to assist admissions personnel and other test users. Use of these tables will eliminate the necessity of duplication in admissions and placement testing where an estimate of students' reading skill is required. Certain assumptions and limitations, however, should be considered in the use of these tables.

1. In establishing a conversion table, it is assumed that the two tests are measuring the same construct. If the two tests are not parallel, equating them will provide essentially meaningless results. The content and item-types contained in the Nelson-Denny and the ACT subtests are such that the two tests do overlap in significant ways, thus lending credence to the development and use of conversion tables.

2. Identifying the degree of relationship between ACT scores, Nelson-Denny scores, and course grades or course placement will assist in determining the validity of these conversions. Unless the Nelson-Denny and the ACT scores correlate equally with the criterion, the predictive accuracy of these equations will vary from group to group. As a result, the predictions would be biased such that it might be to an individual's advantage or disadvantage (in regard to the accuracy of the decision made with the test data) to use ACT scores rather than Nelson-Denny scores. To ensure maximum predictive accuracy, local prediction equations should be established.
3. All predicted scores are either Form C or Form E raw scores. The tables are not interchangeable, nor should they be used with Forms D or F Nelson-Denny raw scores.
4. A 68% confidence interval at the mean for the predicted raw scores extends about 15 points on either side of the tabled scores for Form C, and about 17 points for Form E. Though this establishes a fairly wide range around the predicted raw score, it also effectively excludes a portion of the total score range.
5. The percentile ranks are based upon regressed Total raw scores (estimated) and so will not correspond to the Grade 13 percentile ranks in the Nelson-Denny manuals.
6. For this sample, the Form C group obtained Nelson-Denny Total scores ranging from 20 to 158 and ACT English Usage and ACT Social Studies Reading scores ranging from 1 to 33; the Form E group obtained Nelson-Denny scores ranging from 23 to 167 and ACT scores ranging from 2 to 34. Predictions involving scores outside of these ranges may cause occasional errors greater than those already indicated.

TABLE 6

ACT ENGLISH — **Conversion Table for Form C Predicted Total Raw Scores**

ACT SOCIAL STUDIES

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
1							27	29	31	33	35	37	39	41	43	45	47	49	51	53																
2						26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56															
3			25		26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60													
4				25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	61	63												
5			25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	61	63	65	67											
6		24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70										
7	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74									
8	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77								
9	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81							
10	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84						
11	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88					
12	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91				
13	33	35	37	39	41	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	92	94			
14	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98		
15	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	83	85	87	89	91	93	95	97	99	101	
16	37	39	41	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	101	103	105
17	39	41	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106
18	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108
19	42	44	46	48	50	52	54	56	58	60	62	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	101	103	105	107	109
20	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	101	103	105	107	109	111
21		47	49	51	53	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112
22			50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114
23				53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	101	103	105	107	109	111	113	115
24					57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	101	103	105	107	109	111	113	115	117
25						60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118
26							64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120
27								67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	101	103	105	107	109	111	113	115	117	119	121
28									71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	101	103	105	107	109	111	113	115	117	119	121	123
29										74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124
30											78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126
31												81	83	85	87	89	91	93	95	97	99	101	103	105	107	109	111	113	115	117	119	121	123	125	127
32													85	87	89	91	93	95	97	99	101	103	105	107	109	111	113	115	117	119	121	123	125	127	129
33														88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130
34															92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132
35																95	97	99	101	103	105	107	109	111	113	115	117	119	121	123	125	127	129	131	133	135
36																	99	101	103	105	107	109	111	113	115	117	119	121	123	125	127	129	131	133	135	137

SE_E = 15.2

TABLE 7

ACT ENGLISH — **Conversion Table for Form E Predicted Total Raw Scores**

ACT Social Studies	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
1							47	49	51	53	55	57	59	61	63	65	67	69	71	73																
2						46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76															
3			45		46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80													
4				46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84												
5			45	47	59	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87											
6		45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91										
7	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95									
8	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98								
9	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102							
10	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106						
11	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110					
12	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	101	103	105	107	109	111	113				
13	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	101	103	105	107	109	111	113	115	117			
14	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	101	103	105	107	109	111	113	115	117	119	121		
15	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	
16	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128
17	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132
18	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	101	103	105	107	109	111	113	115	117	119	121	123	125	127	129	131	133
19	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	101	103	105	107	109	111	113	115	117	119	121	123	125	127	129	131	133	135
20	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	101	103	105	107	109	111	113	115	117	119	121	123	125	127	129	131	133	135	137
21		71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	101	103	105	107	109	111	113	115	117	119	121	123	125	127	129	131	133	135	137	139
22			74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140
23				78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140	142
24					82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140	142	144
25						85	87	89	91	93	95	97	99	101	103	105	107	109	111	113	115	117	119	121	123	125	127	129	131	133	135	137	139	141	143	145
26							89	91	93	95	97	99	101	103	105	107	109	111	113	115	117	119	121	123	125	127	129	131	133	135	137	139	141	143	145	147
27								93	95	97	99	101	103	105	107	109	111	113	115	117	119	121	123	125	127	129	131	133	135	137	139	141	143	145	147	149
28									96	98	100	102	104	106	108	110	112	114	116	118	120	122	125	127	129	131	133	135	137	139	141	143	145	147	149	151
29										100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152
30											104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154
31												108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156
32													111	113	115	117	119	121	123	125	127	129	131	133	135	137	139	141	143	145	147	149	151	153	155	157
33														115	117	119	121	123	125	127	129	131	133	135	137	139	141	143	145	147	149	151	153	155	157	159
34															119	121	123	125	127	129	131	133	135	137	139	141	143	145	147	149	151	153	155	157	159	161
35																122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156	158	160	162
36																	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156	158	160	162	164

SE_E = 16.6

TABLE 8

Percentile Rank and Grade Equivalent Conversions for Form C Predicted Total Raw Scores

Predicted Raw	PR	Grade Equivalents	Predicted Raw	PR	Grade Equivalents
110+	99		71	37	13.3
106-109	98		70	36	13.3
105	97		69	34	13.2
104	96		68	32	13.1
102-103	95		67	31	13.1
101	94		66	30	13.0
100	93		65	28	12.9
99	92		64	26	12.8
98	91		63	25	12.7
97	89		62	23	12.6
96	88		61	22	12.5
95	86		60	21	12.3
94	85	15.0	59	19	12.1
93	83	14.9	58	18	12.0
92	81	14.9	57	17	11.8
91	79	14.8	56	15	11.6
90	77	14.7	55	14	11.5
89	75	14.6	54	13	11.3
88	72	14.5	53	12	11.1
87	70	14.5	52	11	10.9
86	68	14.4	51	10	10.7
85	65	14.3	50	9	10.6
84	63	14.2	49	8	10.4
83	61	14.2	48	7	10.2
82	59	14.1	47	7	10.0
81	57	14.0	46	6	9.8
80	55	14.0	45	5	9.7
79	53	13.9	44	5	9.5
78	51	13.9	43	4	9.3
77	50	13.8	42	3	9.1
76	47	13.7	41	3	8.9
75	45	13.6	40	2	8.8
74	43	13.6	39	2	8.6
73	41	13.5	38	2	8.5
72	39	13.4	33-37	1	7.5-8.3

TABLE 9

Percentile Rank and Grade Equivalent Conversions for Form E Predicted Total Raw Scores

Predicted Raw	PR	Grade Equivalents	Predicted Raw	PR	Grade Equivalents
135+	99		99	39	13.9
134	98	16.9	98	37	13.8
133	98	16.8	97	35	13.7
132	97	16.7	96	33	13.7
131	97	16.7	95	31	13.6
130	96	16.6	94	29	13.5
129	96	16.5	93	27	13.4
128	95	16.4	92	25	13.4
127	94	16.3	91	24	13.3
126	93	16.2	90	22	13.2
125	91	16.1	89	21	13.1
124	90	16.0	88	19	13.0
123	89	16.0	87	18	12.8
122	87	15.9	86	17	12.7
121	86	15.8	85	16	12.6
120	84	15.7	84	15	12.4
119	82	15.6	83	13	12.3
118	80	15.5	82	12	12.2
117	78	15.4	81	11	12.1
116	76	15.3	80	10	12.0
115	74	15.2	79	9	11.9
114	72	15.1	78	8	11.8
113	69	15.0	77	8	11.6
112	67	15.0	76	7	11.5
111	65	14.9	75	6	11.3
110	63	14.8	74	6	11.2
109	61	14.8	73	5	11.1
108	58	14.7	72	4	11.0
107	56	14.6	71	4	10.8
106	54	14.5	70	3	10.7
105	52	14.5	69	3	10.6
104	50	14.4	68	2	10.5
103	47	14.3	67	2	10.3
102	45	14.2	66	2	10.2
101	43	14.1	60-65	1	9.4-10.1
100	41	14.0			

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